

Appl. No. 10/603,361
Reply to Office Action of 12/30/2005
Amdt. dated 03/23/2006

Attorney Docket No.: N1085-00089
TSMC 2002-0917

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application:

1 1. (Currently Amended) A method of making a multiple gate electrode on a
2 semiconductor device, comprising the steps of:

3 coating a layer of gate electrode material over top and past the opposed sides of
4 a semiconductor device that has been previously coated with a thin film of gate
5 dielectric on the top and the opposed sides of the semiconductor device; and

6 planarizing the layer of gate electrode material to produce a substantially planar
7 surface formed only of the gate electrode material disposed atop the semiconductor
8 device and extending that extends past each of the opposed sides, prior to patterning
9 the gate electrode material to form a discrete multiple gate electrode on the
10 semiconductor device.

1 2. (Original) The method of claim 1, further comprising the steps of:

2 applying a photoresist mask of substantially uniform thickness on the planar top
3 surface of the planarized gate electrode material;

4 patterning the photoresist mask to cover a corresponding pattern of the discrete
5 multiple gate electrode; and

6 etching the gate electrode material that is uncovered by the photoresist mask to
7 form the discrete multiple gate electrode.

1 3. (Original) The method of Claim 1, further comprising the step of:

2 conforming the layer of gate electrode material with a step height increase
3 corresponding to an increased step height of the semiconductor device.

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1 4. (Original) The method of claim 1, wherein the semiconductor device
2 comprises a silicon fin

1 5. (Original) The method of claim 1 wherein; the semiconductor device comprises a
2 fin of silicon and germanium.

1 6. (Original) The method of claim 1, further comprising the steps of:

2 applying a photoresist mask of substantially uniform thickness on the planar top
3 surface of the planarized gate electrode material, the mask comprising photoresist and
4 a mask material selected from the group comprising, silicon nitride, silicon oxynitride,
5 silicon oxide and photo resist, or combinations thereof;

6 patterning the photoresist mask to cover a corresponding pattern of the multiple
7 gate electrode; and

8 etching the gate electrode material that is uncovered by the photoresist mask to
9 form the discrete multiple gate electrode.

1 7. (Original) The method of claim 1, further comprising the steps of:

2 applying a photoresist mask of substantially uniform thickness on the planar top
3 surface of the planarized gate electrode material;

4 patterning the photoresist mask to cover a corresponding pattern of the multiple
5 gate electrode; and

6 plasma etching the gate electrode material that is uncovered by the photoresist
7 mask to form the patterned multiple gate electrode.

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- 1 8. (Original) The method as recited in claim 1, further comprising the step of:
2 applying a mask over the planarized surface, wherein the mask is of substantially
3 uniform thickness for accurate patterning thereof.
- 1 9. (Original) The method of claim 1 wherein, the gate dielectric comprises silicon
2 oxide.
- 1 10. (Original) The method of claim 1 wherein, the gate dielectric comprises silicon
2 oxynitride.
- 1 11. (Original) The method of claim 1 wherein, the gate dielectric comprises a high
2 permittivity material.
- 1 12. (Original) The method of claim 1 wherein, the gate dielectric comprises a material
2 having a permittivity greater than 5.
- 1 13. (Original) The method of claim 1 wherein, the gate dielectric comprises a
2 thickness in the range of 3 and 100 Angstroms.
- 1 14. (Original) The method of claim 1 wherein, the multiple gate electrode comprises
2 polycrystalline silicon.
- 1 15. (Original) The method of claim 1 wherein, the multiple gate electrode comprises
2 a conductive material.
- 1 16. (Original) The method of claim 1 wherein, the multiple gate electrode comprises
2 a metal material.
- 1 17. (Currently Amended) A semiconductor device having a multiple gate electrode,
2 comprising:

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3 the semiconductor device having a projecting fin coated with a gate dielectric film
4 over top and opposed sides of the fin;

5 a multiple gate electrode on each of the opposed sides of the fin, the multiple
6 gate electrode formed of a layer of gate electrode material and having a substantially
7 planar surface ~~extending over the top~~ disposed atop the gate dielectric film formed over
8 the top of the fin and extending past each of the opposed sides of the fin; and

9 a patterned mask on the planar surface of the multiple gate electrode, the
10 patterned mask having a substantially uniform thickness and a substantially planar
11 surface.

1 18. (Previously Presented) The semiconductor device of claim 17 wherein, the
2 multiple gate electrode is a portion of the layer of gate electrode material which has a
3 planarized surface that includes the planar surface of the multiple gate electrode.

1 19. (Currently Amended) A method of making a multiple gate electrode on a
2 semiconductor device, comprising:

3 providing a semiconductor device over a planar surface that extends from each
4 of opposed sides of the semiconductor device;

5 coating a top and the opposed sides of the semiconductor device with a thin film
6 gate dielectric;

7 coating a layer of gate electrode material over the semiconductor device and the
8 planar surface; and

9 planarizing the layer of gate electrode material to produce a substantially planar
10 surface formed only of the gate electrode material prior to patterning the gate electrode

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- 11 material to form a discrete multiple gate electrode on the semiconductor device, the
- 12 substantially planar surface disposed atop the semiconductor device.